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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/623,612	07/22/2003	Won-Tai Ki	SEC.1026	5056

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EXAMINER

YOUNG, CHRISTOPHER G

ART UNIT	PAPER NUMBER
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1756

DATE MAILED: 03/10/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/623,612	Applicant(s) KI, WON-TAI	
	Examiner Christopher G. Young	Art Unit 1756	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 July 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-4 are rejected under 35 U.S.C. 102(b) as being anticipated by Nakasuji et al., US Patent Number 6,162,581.

The instant application is drawn to an electron beam lithography method includes extending the widths of a plurality of stripes which divide a region where an electron beam exposure is to be performed, so that the boundaries of the stripes overlap adjacent stripes at each boundary, and sequentially exposing each of the stripes to an electron beam.

The prior art reference teaches charged-particle-beam pattern-transfer methods and apparatus are disclosed. Circuit patterns on a mask are divided into a plurality of fields, each field including respective connection ends. Fields that are to be adjacent as transferred to a substrate include a common portion of the circuit pattern in their respective connection ends. The common portions are projected onto the substrate to substantially overlap. The connection ends are illuminated by an image of a shaping aperture image that is illuminated with a charged-particle beam. The shaping-aperture

image can be scanned across the fields so that wafer areas corresponding to the connection ends are exposed during exposure of the connecting adjacent fields and so that the dose received by the wafer is substantially uniform. The shaping-aperture image can be vibrated in a direction perpendicular to a scanning direction to illuminate connection ends. The vibration provides uniform dose on the wafer in areas corresponding to the connection ends. With such methods, circuit patterns are connected, even if the patterns from the fields are slightly offset.

Column 3, lines 34-45, teach that subfields of the fields are illuminated with an image of a shaping aperture that is illuminated with a CPB. The shaping aperture image is moved across the fields in the x-direction by deflecting the CPB and in the y-direction by mechanically moving the mask. Patterns in the connection ends of the fields are transferred to the wafer to overlap the patterns from corresponding connection ends of adjacent fields. The sum of the doses received by the substrate by exposure to two fields is substantially equal to the dose received by exposure of the substrate corresponding to non-connection end portions of the fields.

At column 9 it is disclosed that if patterns from the field 63a (and the other fields) are transferred by stepping the shaping-aperture image across the mask 9 instead of scanning, then the exposure time for the connection end 64a is selected to be about 50% of the exposure time for more on-axis subfields, such that the subfields 210, 220. The total dose on the wafer 13 in the common pattern-connection area from exposure of the fields 63a, 63b is then substantially the same as the dose corresponding to other portions of the fields.

As has been described, the connection ends 64a, 64b and the connection ends 64c, 64d, respectively contain common patterns and the respective common patterns are projected onto the same location on the wafer 13. Therefore, the wafer 13 is exposed to these common patterns twice, with individual exposures providing a linearly varying dose so that the total dose in this area of the wafer 13 is substantially the same as the dose received by other exposed regions of the wafer 13. Even if the projected patterns of adjacent fields are slightly misaligned as projected onto the wafer 13, the linearly varying dose connects the patterns smoothly.

Based on these teachings the scope of claims 1-4 is anticipated.

3. Claims 1, 5 and 9 are rejected under 35 U.S.C. 102(b) as being anticipated by Yamaguchi et al., US Patent Number 5,894,057.

The instant application is drawn to an electron beam lithography method includes extending the widths of a plurality of stripes which divide a region where an electron beam exposure is to be performed, so that the boundaries of the stripes overlap adjacent stripes at each boundary, and sequentially exposing each of the stripes to an electron beam.

The patent teaches a charged beam drawing method comprising a first step of setting a stripe field independent of drawing pattern definition data and of determining the drawing pattern definition data which belongs to the stripe field set, a second step of setting a sub-field independent of the drawing pattern definition data and of determining the drawing pattern definition data which belongs to the sub-field, among the drawing

pattern definition data determined, a third step of drawing the drawing pattern definition data which belongs to the sub-field onto an object to be subjected to drawing, a fourth step of shifting a position of the stripe field by a first predetermined value, and of shifting a position of the sub-field by a second predetermined value, and a fifth step of repeating the first to fourth steps for at least two times.

The reference clearly teaches an electron beam exposure method with overlapping stripes, including a step of moving the overlapping regions. Based on this, claims 1, 5 and 9 are anticipated.

4. Claims 1-3 are rejected under 35 U.S.C. 102(b) as being anticipated by Okino, US Patent Number 6,258,511.

The instant application is drawn to an electron beam lithography method includes extending the widths of a plurality of stripes which divide a region where an electron beam exposure is to be performed, so that the boundaries of the stripes overlap adjacent stripes at each boundary, and sequentially exposing each of the stripes to an electron beam.

The prior art teaches an exposure method using a charged particle beam is used to improve the accuracy of stitching the patterns according to the divided pattern transfer. The exposure method according to the present invention comprises dividing the pattern into a plurality of subfields arranged in stripes; forming the subfields (41L) and (41R) laid around the boundary in the adjacent stripes (49L) and (49R), exposing the subfields (41L) and (41R) by half the exposure time amount, and overlapping the

images of the patterns of the subfields (41L) and (41R) at substantially the same position on the wafer.

This reference clearly shows the broad scope of protection sought through claims 1-3.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 5-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakasuji et al., US Patent Number 6,162,581, in combination with Yamaguchi et al., US Patent Number 5,894,057.

The instant application is drawn to an electron beam lithography method includes extending the widths of a plurality of stripes which divide a region where an electron beam exposure is to be performed, so that the boundaries of the stripes overlap adjacent stripes at each boundary, and sequentially exposing each of the stripes to an electron beam.

The Nakasuji et al. prior art reference teaches charged-particle-beam pattern-transfer methods and apparatus are disclosed. Circuit patterns on a mask are divided into a plurality of fields, each field including respective connection ends. Fields that are

to be adjacent as transferred to a substrate include a common portion of the circuit pattern in their respective connection ends. The common portions are projected onto the substrate to substantially overlap. The connection ends are illuminated by an image of a shaping aperture image that is illuminated with a charged-particle beam. The shaping-aperture image can be scanned across the fields so that wafer areas corresponding to the connection ends are exposed during exposure of the connecting adjacent fields and so that the dose received by the wafer is substantially uniform. The shaping-aperture image can be vibrated in a direction perpendicular to a scanning direction to illuminate connection ends. The vibration provides uniform dose on the wafer in areas corresponding to the connection ends. With such methods, circuit patterns are connected, even if the patterns from the fields are slightly offset.

This reference does not teach moving the overlap regions of the stripes. The Yamaguchi patent teaches a charged beam drawing method comprising a first step of setting a stripe field independent of drawing pattern definition data and of determining the drawing pattern definition data which belongs to the stripe field set, a second step of setting a sub-field independent of the drawing pattern definition data and of determining the drawing pattern definition data which belongs to the sub-field, among the drawing pattern definition data determined, a third step of drawing the drawing pattern definition data which belongs to the sub-field onto an object to be subjected to drawing, a fourth step of shifting a position of the stripe field by a first predetermined value, and of shifting a position of the sub-field by a second predetermined value, and a fifth step of repeating the first to fourth steps for at least two times.

It would have been prima facie obvious to one of ordinary skill in the art to move the overlap regions (stitching areas) as taught by Yamaguchi et al. in the charged particle beam exposure method of Nakasuji et al. with a reasonable expectation of achieving highly useful finished product patterns for the purpose of providing a charged beam drawing method which realizes sub-field multi-drawing and stripe multi-drawing only with use of one piece of drawing pattern definition data, without involving large repetition of sub-fields and without preparing data in compliance with the number of times for which a pattern is multi-passed.

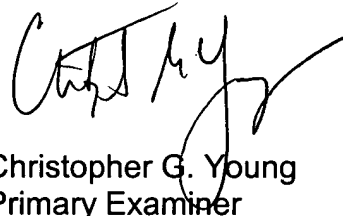
Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher G. Young whose telephone number is 571-272-1394. The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1756

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'C. Young', with a large, sweeping flourish extending from the end of the signature.

Christopher G. Young
Primary Examiner
Art Unit 1756

cgy